LOC Control Techniques

- Techniques to Control Lost Circulation in Drilling Through Under-Saturated, High-Permeability Formations

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What's the Problem?

- Producing formations depleted from virgin pressures
- Wellbore stability, casing string designs may cause problem
- Trapped pressures in source rock require high MWs; lead to very high overbalances & Delta P
- Weakened rock matrices
- Synthetic Oil Based Muds

Problem Magnitude

- Losses may be almost inevitable
- Once begun, LOC very difficult to cure when drilling with SBM
- Typically, losses > 25 bbl/hr require a response from rig team
- @ $300/bbl, this could lead to a $180,000 mud loss in 24 hours
- Sen. Dirksen from Illinois

Response Strategies

- Systematic, Rigorous, Progressive
- Ramping-Up Approach
- Avoid the Problem
- Watch Indicators, React to Seepage Losses
- Manage ECD, Hydraulics, ROP
  - **Hole Cleaning Cycles**
- Kick Tolerance Consideration?

Progressive Response

- Sweeps: $CaCO_3$, G-Seal, Master-seal, 50-70 bbl's @ 50-80 #/bbl (Lower end to maintain drilling)
- High Fluid Loss Squeezes: Frac Attack, Gunk Squeezes can be placed through drill string usually
- Dia-SealM & Cement Squeeze: POOH required, TIH OH
- Contingency string or live with the losses if you're at a casing point

Working the Problem

- Early on, the loss zone(s) must be identified. Area knowledge?
- Resistivity Info (Invasion)
- Sand/Shale Interfaces
- At the Bit
- Casing Shoe or 1st Sand
- Rubble Zones (Sub-salt wells)
- Primary Cementing Considerations

Moving On

- After spotting pills, pull up, circ to ensure drill string is unplugged and free and monitor losses for 3-4 hours while well heals (and LCM migrates into position)
- If squeezing, use a 5-minute hesitation squeeze technique with no more than 50 psi increase per squeeze increment. Max 250-300

Continue to Monitor

- When LOC is healed, it's usually a temporary fix, except in the case of Dia-SealM & cement squeezes
- Monitor returns at all times and be aware of positions of drill string tools such as stabilizers and bit
- If LOC occurs again, determine immediately if it's a new zone or the problem you just fixed

Important Considerations

- Care and feeding of the reservoir
- Rock matrix is under-strength, in the case of prior depletion
- Use Risk Management matrix to systematically determine the proper response level
- DO NOT PRE-TREAT!
  - **Causes the problem you're trying to avoid**

Summary Points

- Lost Circulation, particularly in SBM, can quickly add up to the loss of hundreds of thousands of dollars + severe reservoir damage
- Anticipate the problem (logistics)
- Systematic Response
- Intelligent Drilling with all the relevant data points, ECDs, a patient approach to solutions